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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,872	06/24/2003	Won-Bong Choi	030681-521	1325
21839 7590 01/02/2008 BUCHANAN, INGERSOLL & ROONEY PC POST OFFICE BOX 1404 ALEXANDRIA, VA 22313-1404			EXAMINER LEE, CYNTHIA K	
			ART UNIT 1795	PAPER NUMBER
			NOTIFICATION DATE 01/02/2008	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/601,872

Applicant(s)

CHOI ET AL.

Examiner

Cynthia Lee

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 13-16 and 31-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 13-16 and 31-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 October 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/12/2007 has been entered.

Specification

The Specification submitted 10/17/2006 and 4/30/2007 has been accepted by the Examiner.

Drawings

The Drawing submitted 10/17/2006 has been accepted by the Examiner.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 33-35, 37-39, 41, are rejected under 35 U.S.C. 102(e) as being anticipated by Li (US 7157068).

Li discloses branched carbon nanotubes, particularly non-aligned CNTs, with different tubule morphologies that include, for example, (1) cylindrical hollow single-walled and multi-walled nanotube structures (SWNT and MWNT respectively), (2) conically overlapping or "bamboo-like" tubule structures, wherein successive end-capped graphene layers comprising individual tubules are staggered in a telescoping, stacked arrangement; and (3) branched or "Y-shaped" tubule structures with symmetric, straight-armed tubules forming fixed angles between individual arms. Branched CNTs can include, for example, "Y-shaped" CNTs and "kinked" CNTs. The methods of the present invention allow the control of morphology and structural characteristics of individual CNT tubules during their formation, thereby enabling the synthesis of CNTs with specific morphology, structure, mechanical and chemical properties. Thus CNTs having either a cylindrical, hollow tubule structure with concentric graphene layers, or a conical "bamboo-like" structure wherein successive end-capped graphene layers are staggered in a telescoping, stacked arrangement can be produced by the methods of the present invention. These configurations are schematically illustrated in FIG. 1 (3:5-35). Also refer to 8:45-63.

Li does not expressly disclose the internal and external walls of the carbon nanotubes are uniformly doped with catalyst particles. The Instant Specification states on pg 6, lines 3-4 that "While carbon nanotubes grow, most metallic catalyst particles adsorb onto the internal and external walls of the carbon nanotubes." The Examiner notes that Li's internal and external walls of the carbon nanotubes are also doped with catalyst particles. Absent specific degree of "uniform," the Examiner notes that mixing

of catalyst particles in Li's Example 2 meets the limitation "uniform" (applicant's claim 35,).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 13, 14, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (US 7157068) as applied to claim 1, in view of Coll (US 6596187)

Li discloses branched carbon nanotubes, particularly non-aligned CNTs, with different tubule morphologies that include, for example, (1) cylindrical hollow single-walled and multi-walled nanotube structures (SWNT and MWNT respectively), (2) conically overlapping or "bamboo-like" tubule structures, wherein successive end-capped graphene layers comprising individual tubules are staggered in a telescoping, stacked arrangement; and (3) branched or "Y-shaped" tubule structures with symmetric, straight-armed tubules forming fixed angles between individual arms. Branched CNTs can include, for example, "Y-shaped" CNTs and "kinked" CNTs. The methods of the present invention allow the control of morphology and structural characteristics of individual CNT tubules during their formation, thereby enabling the synthesis of CNTs with specific morphology, structure, mechanical and chemical properties. Thus CNTs having either a cylindrical, hollow tubule structure with concentric graphene layers, or a

conical "bamboo-like" structure wherein successive end-capped graphene layers are staggered in a telescoping, stacked arrangement can be produced by the methods of the present invention. These configurations are schematically illustrated in FIG. 1 (3:5-35). Also refer to 8:45-63. Li discloses that the metallic particles are about 0.01 um (or 10 nanometer) (9:67).

The catalytic substrates constituting the catalyst materials of the present invention for producing branched CNTs preferably comprise at least one transition metal or metal alloy that is deposited on or impregnated within a support substrate comprising a metallic material or a non-metallic material, such as for example, a non-metallic oxide. Preferred metallic materials in the catalytic substrates of the invention include iron, cobalt, nickel, or alloys and combinations thereof (10:5-20). Applicant's claim 2

Li discloses that the carbon substrate is a particulate, for example, mesoporous silica, mesoporous alumina, or mixtures and combinations thereof (9:60-64). Li does not disclose that the substrate is carbon cloth or carbon paper (applicant's claim 1). Coll teaches that a substrate for carbon nanotubes can be made of carbon (2:35) in which Coll's carbon nanotubes can be used for fuel cells (7:53). It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Li's particulate material with Coll's carbon because it has been held by the court that the selection of a known material based on its suitability for its intended use is *prima facie* obvious. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07.

Li discloses an electrode does not disclose a fuel cell with the electrode (applicant's claims 13 and 14). Li discloses that the electrode as disclosed can be used in fuel cells (5:37). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the electrode as disclosed in a fuel cell for the benefit of using an electrode with high purity, as disclosed by Li (3:1).

Li does not expressly disclose the internal and external walls of the carbon nanotubes are uniformly doped with catalyst particles. The Instant Specification states on pg 6, lines 3-4 that "While carbon nanotubes grow, most metallic catalyst particles adsorb onto the internal and external walls of the carbon nanotubes." The Examiner notes that Li's internal and external walls of the carbon nanotubes are also doped with catalyst particles. Absent specific degree of "uniform," the Examiner notes that mixing of catalyst particles in Li's Example 2 meets the limitation "uniform" (applicant's claim 1).

Li does not expressly disclose that the catalyst particles are dispersed to a degree of 0.3-5 mg/cm². Li discloses that catalyst nanoparticles are impregnated into a mesoporous silica, which is ground into micro-particles to increase reactive surface area of the catalyst substrate. It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the size of the catalyst particles for the benefit of increasing or decreasing the surface area of the effective catalytic sites (Applicant's claim 1).

Claims 3, 4, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (US 7157068) in view of Coll (US 6596187) as applied to claim 1, further in view of Kaiser (US 2002/0068213).

Li modified by Coll does not disclose that the carbon substrate is carbon cloth or carbon paper. Kaiser teaches that the gas diffusion layer or electrode can be made of conductive materials with a gas diffusion property such as carbon cloth or porous carbon papers [0025]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the carbon of Li modified by Coll with carbon paper or carbon cloth for fuel cell electrodes, as taught by Kaiser because it has been held by the court that the selection of a known material based on its suitability for its intended use is *prima facie* obvious. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07. Applicant's claims 3 and 15.

Li discloses catalyst of iron, cobalt, nickel, or alloys and combinations thereof (10:5-20). Li does not disclose a catalyst that acts as both a catalyst for carbon nanotube growth and as a fuel cell catalyst. Coll teaches platinum as catalyst for carbon nanotube growth (2:60). It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the catalyst of Li with Coll's platinum catalyst because it has been held by the court that the selection of a known material based on its suitability for its intended use is *prima facie* obvious. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07. The Examiner notes that platinum is a fuel cell catalyst. Applicant's claims 4 and 16.

Claims 36 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (US 7157068) as applied to claims 35 and 39.

Li does not expressly disclose the internal and external walls of the carbon nanotubes are uniformly doped with catalyst particles. The Instant Specification states on pg 6, lines 3-4 that "While carbon nanotubes grow, most metallic catalyst particles adsorb onto the internal and external walls of the carbon nanotubes." The Examiner notes that Li's internal and external walls of the carbon nanotubes are also doped with catalyst particles. Absent specific degree of "uniform," the Examiner notes that mixing of catalyst particles in Li's Example 2 meets the limitation "uniform".

Li does not expressly disclose that the catalyst particles are dispersed to a degree of 0.3-5 mg/cm². Li discloses that catalyst nanoparticles are impregnated into a mesoporous silica, which is ground into micro-particles to increase reactive surface area of the catalyst substrate. It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the size of the catalyst particles for the benefit of increasing or decreasing the surface area of the effective catalytic sites.

Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li (US 7157068) as applied to claim 37, in view of Coll (US 6596187).

Li discloses catalyst of iron, cobalt, nickel, or alloys and combinations thereof (10:5-20). Li does not disclose a catalyst that acts as both a catalyst for carbon nanotube growth and as a fuel cell catalyst. Coll teaches platinum as catalyst for

carbon nanotube growth (2:60). It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the catalyst of Li with Coll's platinum catalyst because it has been held by the court that the selection of a known material based on its suitability for its intended use is *prima facie* obvious. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07. The Examiner notes that platinum is a fuel cell catalyst.

Response to Arguments

Applicant's arguments filed 10/12/2007 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Lee whose telephone number is 571-272-8699. The examiner can normally be reached on Monday-Friday 8:30am-5pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Application/Control Number:
10/601,872
Art Unit: 1795

Page 10

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ckl



RAYMOND ALEJANDRO
PRIMARY EXAMINER